DYNAMIC HOST CONFIGURATION PROTOCOL (DHCP)

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Dynamic Assignment of IP addresses

- Dynamic assignment of IP addresses is desirable for several reasons:
  - IP addresses are assigned on-demand.
  - Avoid manual IP configuration.
  - Support mobility of laptops.
- Three Protocols:
  - RARP (until 1985, no longer used).
  - BOOTP (1985-1993).
  - DHCP (since 1993).
- Only DHCP is widely used today.

Solutions for dynamic assignment of IP addresses

- Reverse Address Resolution Protocol (RARP)
  - RARP is no longer used.
  - Works similar to ARP.
  - Broadcast a request for the IP address associated with a given MAC address.
  - RARP server responds with an IP address.
  - Only assigns IP address (not the default router and subnetmask).

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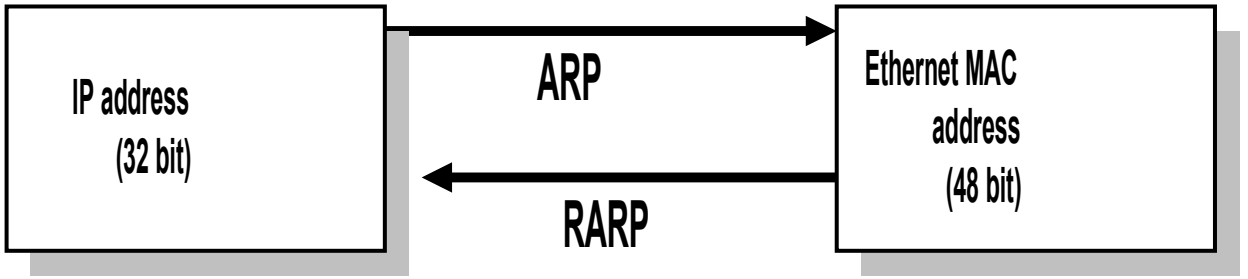
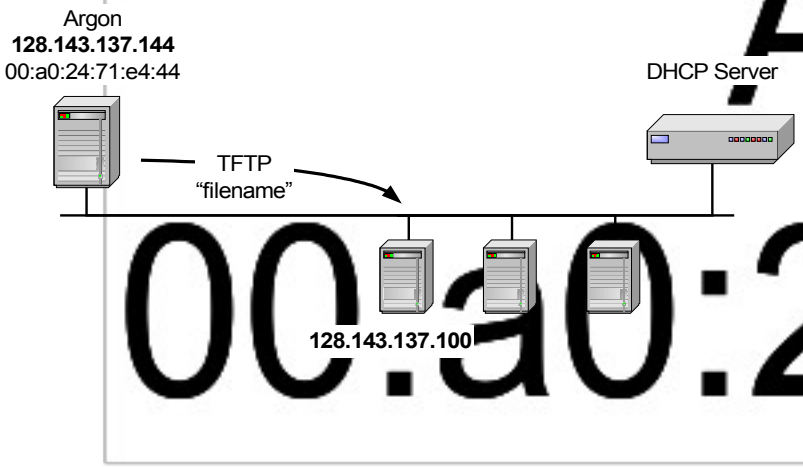


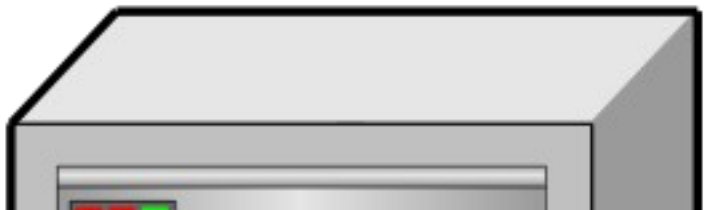
BOOTP

- **BOOTstrap Protocol (BOOTP)**
  - Host can configure its IP parameters at boot time.
  - 3 services.
    - IP address assignment.
    - Detection of the IP address for a serving machine.
    - The name of a file to be loaded and executed by the client machine (boot file name).
- Not only assigns IP address, but also default router, network mask, etc.
- Sent as UDP messages (UDP Port 67 (server) and 68 (host)).
- Use limited broadcast address (255.255.255.255):
- These addresses are never forwarded.

BOOTP Interaction



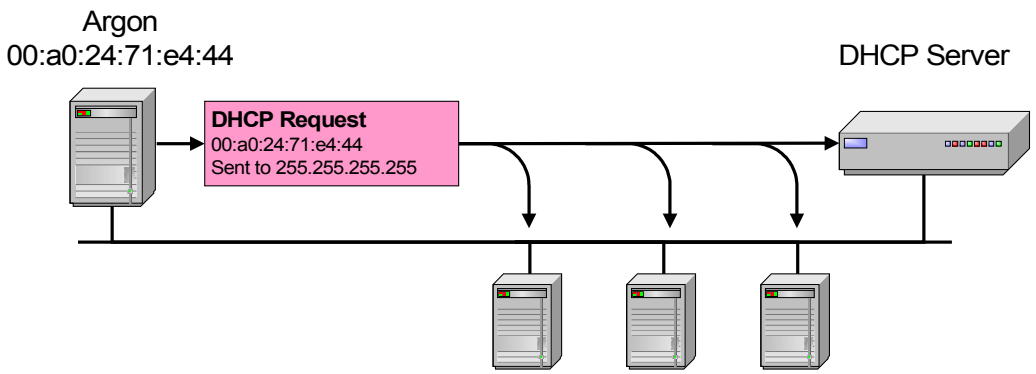
- BOOTP can be used for downloading memory image for diskless workstations.
- Assignment of IP addresses to hosts is static.



DHCP

- **Dynamic Host Configuration Protocol (DHCP)**
  - Designed in 1993.
  - An extension of BOOTP (Many similarities to BOOTP).
  - Same port numbers as BOOTP.
  - Extensions:
    - Supports temporary allocation (“leases”) of IP addresses.
    - DHCP client can acquire all IP configuration parameters.
- DHCP is the preferred mechanism for dynamic assignment of IP addresses.
- DHCP can interoperate with BOOTP clients.

DHCP Interaction (simplified)



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BOOTP/DHCP Message Format

BOOTP/DHCP

- **OpCode: 1 (Request), 2(Reply)**
  Note: DHCP message type is sent in an option.
- **Hardware Type**: 1 (for Ethernet).
- **Hardware address length**: 6 (for Ethernet).
- **Hop count**: set to 0 by client.
- **Transaction ID**: Integer (used to match reply to response).
- **Seconds:** number of seconds since the client started to boot.
- **Client IP address, Your IP address, server IP address, Gateway IP address, client hardware address, server host name, boot file name:**
  client fills in the information that it has, leaves rest blank.

DHCP Message Type

- Message type is sent as an option.

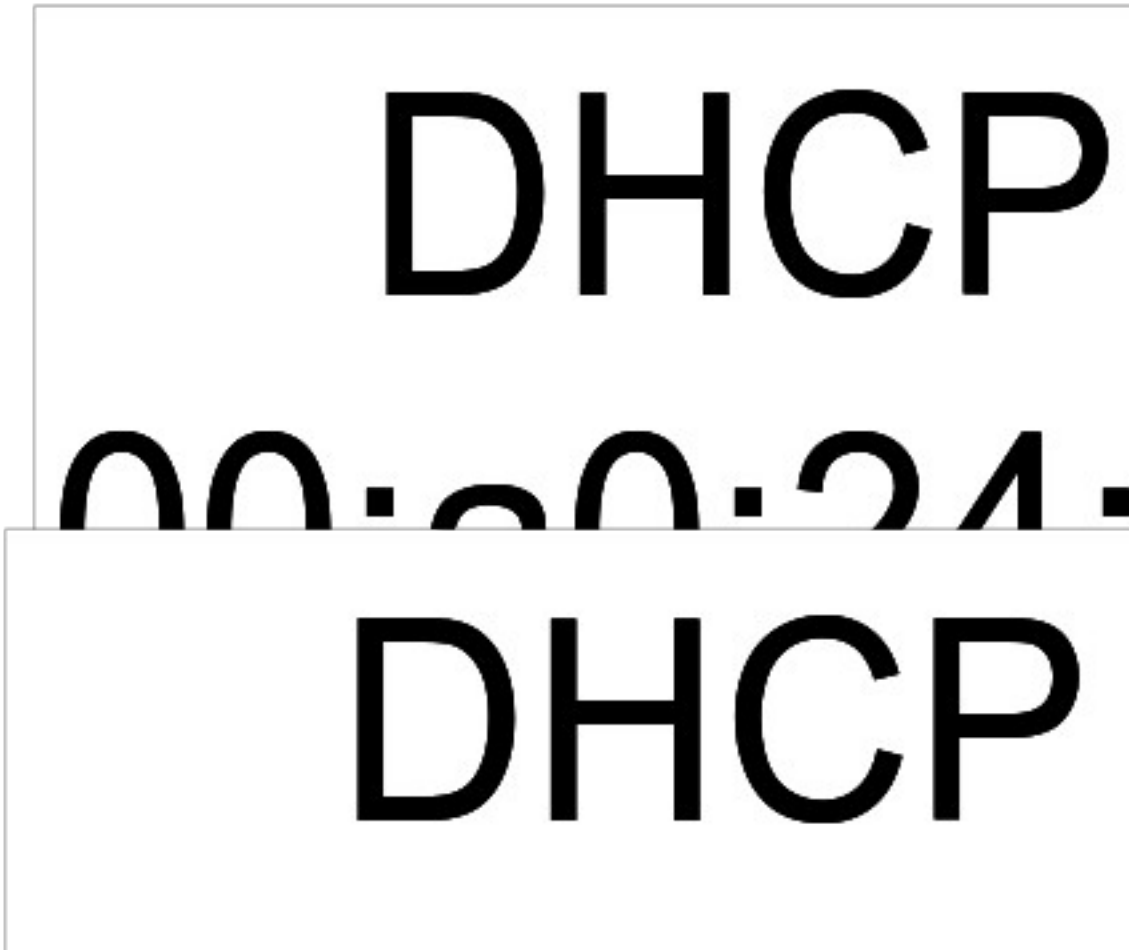
Value	Message Type
1	DHCPDISCOVER
2	DHCPOFFER
3	DHCPREQUEST
4	DHCPDECLINE
5	DHCPACK
6	DHCPNAK
7	DHCPRELEASE
8	DHCPINFORM

Other options (selection)

- Other DHCP information that is sent as an option:
  - Subnet Mask
  - Name Server
  - Hostname
  - Domain Name
  - Forward On/Off
  - Default IP TTL
  - Broadcast Address
  - Static Route
  - Ethernet Encapsulation
  - X Window Manager
  - X Window Font
  - DHCP Msg Type
  - DHCP Renewal Time
  - DHCP Rebinding
  - Time SMTP-Server
  - SMTP-Server
  - Client FQDN
  - Printer Name
  - …etc.

DHCP Operation

- DCHP DISCOVER
- DCHP OFFER



DHCP Operation

- DCHP DISCOVER

At this time, the DHCP client can start to use the IP address

- Renewing a Lease
- (sent when 50% of lease has expired)
- If DHCP server sends DHCPNACK, then address is released.

DHCP Operation

- DCHP RELEASE

•At this time, the DHCP client has released the IP address.

Q&A.

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THANK YOU!